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United States  
Department of  
Agriculture

Forest Service

Pacific Northwest  
Research Station

Research Note  
PNW-437

January 1986



# Inventory and Value of Old-Growth in the Douglas-Fir Region

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## Abstract

Timber inventory data for all owners in western Washington and western Oregon were summarized by age classes to provide an estimate of the remaining amount of old growth timber. The data suggest that roughly 30 percent of the timberlands in the Douglas-fir region contain essentially mature timber (stands whose age is in excess of culmination of mean annual increment). Available information on value of old growth is scanty but does suggest that old-growth Douglas-fir is some 56 percent more valuable than second-growth Douglas-fir.

Keywords: Old-growth stands, stumpage prices, stumpage evaluation, timber supply.

## Background

About half of the softwood timber inventory for the United States is on public lands in the West. Much of this timber is in stands commonly called old growth. The term "old growth" lends itself to an array of interpretations, but most definitions in the Pacific Northwest include age. Policies regarding the management and eventual harvest of old-growth timber are controversial because, without an explicit definition, basic management information is lacking. During the early 1980's, there was a concern that anticipated increases in USDA Forest Service harvest would engender controversy. In an attempt to provide background information for this controversy, the Society of American Foresters, in April 1982, chartered a task force to study issues associated with scheduling the harvest of old-growth timber. The task force was to develop a definition of old growth, assess the amount of remaining old growth, and review current old growth timber harvesting policies. This paper presents the background material prepared for that task force on two issues: (1) the question of how much old growth is still left in the Douglas-fir region and (2) whether old growth commands a higher stumpage price than does second growth.

Work on the first issue involved compiling available inventory statistics for the Douglas-fir region in a manner that would facilitate a discussion of old growth. Because all definitions have some age or size criteria, I assembled the available information for each owner group by stand age, area, and cubic volume. I also replicated the presentation of the data for the other public owners because I had two sources of data for these owners.

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Work on the second issue involved reviewing available stumpage price data to determine if old growth commanded higher stumpage prices than second growth. Higher values for old growth could reflect higher qualities (for example, less knots or more rings per inch) unique to old growth. These values could then be used as justification for retaining and managing older stands.

Following publication of the task force report (Society of American Foresters 1984), the Society of American Foresters adopted a position calling for an ecological definition of old growth, improved inventories, and harvest scheduling based on balancing economic, social, and environmental values.

### **Timber Inventory Statistics for the Douglas-Fir Region**

Timber inventory volumes in cubic feet were compiled from two sources. The primary source was data collected by the Forest Inventory and Analysis unit, USDA Forest Service, Pacific Northwest Research Station, Forestry Sciences Laboratory, Portland, Oregon. These data are described for western Washington by Bassett and Oswald (1981a, 1981b, 1982) and for western Oregon by Jacobs (1978), Bassett (1979), and Mei (1979). These data cover three owner groups: other public, forest industry, and other private (terms are defined in the appendix). The second source of data is the various inventories of public lands conducted by the responsible agencies. For public owners other than the Forest Service and the BLM (Bureau of Land Management, U.S. Department of the Interior), the inventory information collected by the Forest Inventory Analysis unit duplicated the data. The inventories were conducted in the mid-1970's for western Oregon and the late 1970's for western Washington. The National Forest inventories came from Timber Management, Pacific Northwest Region, and represent inventories made, for the most part, in the early 1970's; they are, however, the most recent available.

The spatial detail for the private timberlands and for some public timberlands is limited to multicounty subregions (fig. 1). Forest Service inventory information is available for each National Forest. Age class representations are presented for each owner. Timberland administered by the NPS (National Park Service) is not included in the other public owner group, but the available information is presented in a separate section.

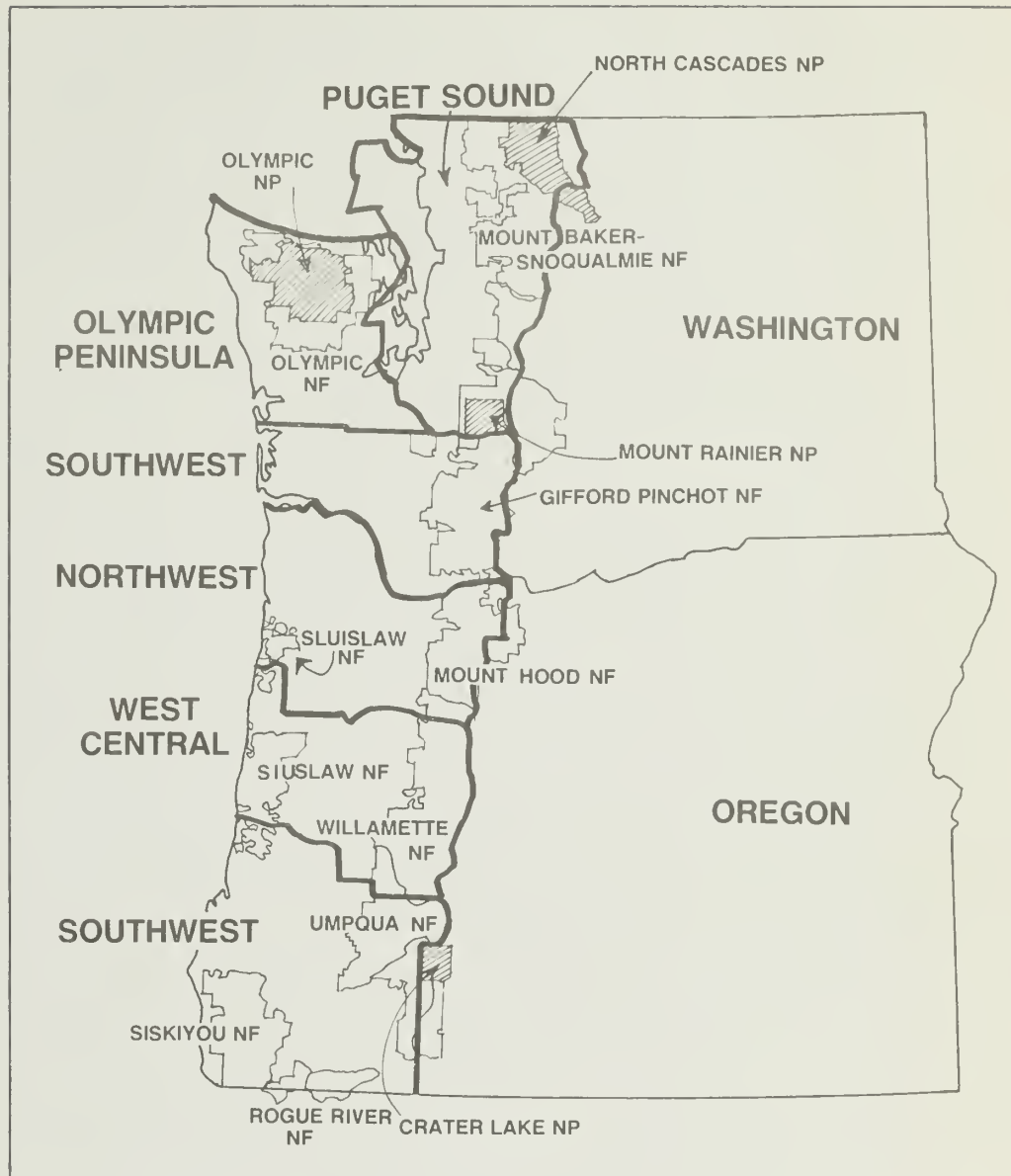


Figure 1.—Inventory units in the Douglas-fir region.

**Timberland Area and  
Cubic Volume by Stand  
Age and Owner Group**

Definitions of each subregion and the location of each west-side National Forest are shown in figure 1. Timberland area and softwood inventory volumes by stand age (in 10-year age classes) for each of the west-side National Forests and various subregional owner groups are given in tables 1 through 5. Uneven-aged stands are presented separately and are split between those less than 100 years old and those over 100 years. The data for other public owners in the State of Washington include small amounts of timberland administered by the BLM. The data for Oregon, however, recognizes timberlands administered by the BLM as a separate ownership.

**Table 1—Timberland area and volume for National Forests in western Washington, by stand age**

Stand age	Mount Baker-Snoqualmie		Olympic		Gifford Pinchot	
	Acres	Volume	Acres	Volume	Acres	Volume
Years	Thousand	Million cubic feet	Thousand	Million cubic feet	Thousand	Million cubic feet
5	17	7	48	3	95	22
15	25	5	25	5	27	14
25	16	10	22	30	11	9
35	17	24	3	5	23	49
45	42	108	37	94	40	140
55	31	64	1	4	51	210
65	42	117	20	82	40	196
75	23	100	4	18	25	146
85	33	156	9	45	15	122
95	23	151	2	15	17	111
105	30	193	10	66	27	202
115	18	112	2	17	15	108
125	26	161	6	40	15	142
135	4	33			15	142
145	55	334	17	152	17	155
155	11	68			6	58
165	4	48			4	24
175	6	49	21	210	13	143
185	64	454			8	94
195	4	27			2	13
250	242	1,962	42	427	78	737
300+	191	1,934	163	1,980	154	1,679
Uneven-aged:						
Under 100	23	68			101	455
Over 100	162	1,143	83	695	223	1,890
Nonstocked	15		21		63	



Table 2—Timberland area and volume for National Forests in western Oregon, by stand age

Stand age	Mount Hood		Willamette		Siuslaw		Umpqua		Rogue River		Siskiyou	
	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume
Years	Thousands	Million cubic feet	Thousands	Million cubic feet	Thousands	Million cubic feet	Thousands	Million cubic feet	Thousands	Million cubic feet	Thousands	Million cubic feet
5	11	11	4	13	26	0	56	7	45	--	43	16
15	17	34	7	11	7	0	14	4	2	--	22	22
25	20	37	4	6	23	61	13	11	8	3	17	22
35	18	49	9	24	6	18	7	17	25	3	15	23
45	28	78	18	58	41	189	9	22	22	8	24	56
55	37	166	24	92	23	100	4	15	25	34	28	57
65	37	159	38	228	75	458	18	90	1	1	17	43
75	31	190	44	284	31	212	18	92	22	20	20	81
85	11	59	36	228	73	673	9	59	5	15	7	30
95	18	154	27	218	19	207	5	31	23	32	11	49
105	2	18	34	276	77	886	18	100	13	35	4	15
115	7	65	38	332	6	47	7	50	17	71	2	9
125	2	9	11	95	8	80	9	48	24	67	2	21
135	4	25	11	108	--	--	4	34	48	66	--	--
145	4	33	29	289	--	--	4	31	30	143	4	23
155	4	30	20	166	3	30	4	19	16	48	2	16
165	5	48	11	82	2	23	4	5	11	49	4	28
175	4	43	5	69	1	6	5	43	13	100	4	11
185	5	66	13	116	5	44	4	35	5	19	2	7
195	--	--	7	63	--	--	7	70	63	462	7	42
250	179	1,939	104	1,066	5	52	79	744	19	218	102	661
300+	39	482	234	2,664	5	98	140	1,470	31	226	69	607
Uneven-aged:												
Under 100	41	217	107	590	3	5	95	397			130	390
Over 100	96	777	218	1,790	77	720	304	2,306	577	3,390	190	997
Nonstocked			5		19		38				19	

-- = Less than 1 million cubic feet.

Table 3—Timberland area and volume for other public owners,<sup>1/</sup> by inventory unit and stand age

Stand age	Puget Sound		Olympic Peninsula		Southwest Washington		Northwest Oregon		West-central Oregon		Southwest Oregon	
	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume
Years	Thousands	Million cubic feet	Thousands	Million cubic feet	Thousands	Million cubic feet	Thousands	Million cubic feet	Thousands	Million cubic feet	Thousands	Million cubic feet
5	81	7	80	1	53	10	108	10			17	1
15	37	18	86	97	42	46	97	71			13	--
25	42	47	76	71	69	122	128	166			12	14
35	103	240	184	285	87	229	82	173				
45	99	387	127	554	64	331	50	209	27	60		
55	119	831	101	761	5	37	8	29	9	40	18	79
65	27	94	44	527	6	43			28	97	15	18
75	13	104	13	94	19	130			9	3	25	11
85	5	38					11	115	3	27	19	191
95							13	174	18	102	2	5
105					19	186					10	47
115	3	48			19	231						
125	10	97										
135					6	103			3	56		
145									3	26		
155												
165			7	84								
175												
185												
195												
250			39	42								
300+	5	25									1	8
Uneven-aged:											2	10
Under 100	22	122	48	226	19	105	49	87			23	70
Over 100	60	435	44	482			17	164	9	87	4	59
Nonstocked			19	1								

<sup>1/</sup>Excluding BLM lands in western Oregon.

-- = Less than 1 million cubic feet.



Table 4—Timberland area and volume for forest industry owners, by inventory unit and stand age

Stand age	Puget Sound		Olympic Peninsula		Southwest Washington		Northwest Oregon		Willamette Valley Oregon		Southwest Oregon	
	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume
Years	Thousands	Million cubic feet	Thousands	Million cubic feet	Thousands	Million cubic feet	Thousands	Million cubic feet	Thousands	Million cubic feet	Thousands	Million cubic feet
5	203	37	184	31	348	24	204	55	248	105	279	16
15	92	39	81	50	184	111	72	19	174	104	185	55
25	100	176	144	200	201	266	155	260	172	354	156	172
35	133	323	194	588	263	873	254	892	106	337	69	186
45	132	572	191	742	118	516	165	652	67	215	19	19
55	114	602	130	1,040	123	705	39	180			46	275
65	13	78	78	547	16	78	44	225	32	166	24	85
75	14	113	71	661	9	123	32	229				
85	8	17	9	117	16	198			16	165	44	82
95	17	33	8	121	14	128	13	130	6	38	10	64
105	17	101			9	149			20	199		
115			9	102	9	56			11	163		
125	6	61	7	100	16	203						
135												
145					5	49						
155												
165												
175												
185												
195	8	73										
250	28	242			5	15			31	260	135	1147
300+	21	172			24	306			33	365	94	668
Uneven-aged:												
Under 100	49	236	66	480	77	411	46	54	86	148	273	670
Over 100	36	210	23	217	12	85			18	82	92	402
Nonstocked	6	--	21	--	45	--						

-- = Less than 1 million cubic feet.

Table 5—Area and volume for other private owners, by inventory unit and stand age

Stand age	Puget Sound		Olympic Peninsula		Southwest Washington		Northwest Oregon		West-central Oregon		Southwest Oregon	
	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume
Years	Thousands	Million cubic feet	Thousands	Million cubic feet	Thousands	Million cubic feet	Thousands	Million cubic feet	Thousands	Million cubic feet	Thousands	Million cubic feet
5	51	12	104	36	75	11	48	18	70	34	50	25
15	42	41	48	19	80	63	47	22	39	15	94	27
25	100	100	22	1	76	80	122	158	134	189	114	105
35	133	193	76	126	68	108	84	158	64	121	78	108
45	173	410	86	155	98	390	87	273	66	145	35	120
55	137	410	74	249	52	157	54	164	44	141	31	31
65	66	310	39	172	34	162	22	52	27	33	20	31
75	42	236	12	55	37	83	15	34	5	20	5	6
85	23	144	19	130			6	68	11	69	12	40
95	8	29									34	40
105	16	102									31	117
115									5	15		
125									9	27		
135												
145												
155												
165												
175												
185												
195												
250												
300+									12	207	7	93
Uneven-aged:												
Under 100	139	334	50	170	39	92	148	340	105	203	190	289
Over 100	17	77	14	72	30	279	4	26			31	77
Nonstocked	54	5	37	20	61	15						

# Growth and Mortality Information

Old-growth stands have frequently been called decadent. The implication is that these stands are slowly deteriorating while still containing a large component of salvable as well as nonsalvable trees. The inventory information for ownerships other than Forest Service (this information is not available for Forest Service lands) contains information on growth and mortality by stand age that demonstrates little factual basis for this supposition. Summaries of this information are shown in table 6. In all cases, net growth of older age classes is positive. The growth volumes in table 6 are for gross growth.

**Table 6—Growth and mortality for all private ownerships, by State and stand age**

Stand age	Western Washington		Western Oregon	
	Growth	Mortality	Growth	Mortality
Years	- - - - - Million cubic feet - - - - -			
5	8	--	7	2
15	66	2	28	1
25	117	3	120	2
35	206	8	127	3
45	200	10	77	3
55	166	11	28	3
65	56	4	13	4
75	37	3	12	1
85	12	1	7	4
95	5	1	1	5
105	8	1	4	--
115	5	1	1	1
125	5	1	1	--
135	1	--	--	--
145	--	--		
155				
165	1	--		
175				
185				
195	--	--		
250	4	1		
300+	1	1	8	4
Uneven-aged:				
Under 100	66	5	1	8
Over 100	21	4	53	7
Nonstocked	1	--		

-- = Less than 1 million cubic feet.

## Other Public Inventory Information

There are several other sources for estimates of old-growth volumes in National Forests and on other public lands. The first is a compilation of Pacific Northwest west-side National Forest lands containing old-growth habitat. This compilation is shown in table 7 and was part of a talk given by the Regional Forester at a conference on old-growth forests (Sirmon 1982). In general this old-growth habitat was timberlands with timber 250 years old or older that have been relatively undisturbed (less than 10-percent entry). The data were taken from inventory statistics collected by Timber Management, Pacific Northwest Region. More complete than this definition of old growth is the one used by the Region that includes stands of 10 acres or more generally containing the following characteristics:

1. Mature and overmature trees in the overstory.
2. Multilayered canopy and trees of several age classes.
3. Standing dead trees and down material are present.
4. Evidence of human activities may be present but such activities have not significantly altered the other characteristics and would be subordinate factors in a description of a stand.

**Table 7—Acreage of National Forests and of old-growth habitat, by Forest**

National Forest	Old-growth habitat <sup>1</sup>	Total forest	Old-growth as a percentage of total
- - <u>Thousand acres</u> - -			<u>Percent</u>
Mount Baker-Snoqualmie	643	1,716	37.5
Olympic	152	651	23.3
Gifford Pinchot	431	1,331	32.4
Mount Hood	259	1,060	24.4
Willamette	385	1,667	23.1
Siuslaw	24	625	3.8
Umpqua	207	988	20.9
Rogue River	71	638	11.1
Siskiyou	230	1,093	21.0

<sup>1</sup> Stands of at least 10 acres, older than 250 years, with less than 10 percent entry.

Inventory information was provided by the three largest other public agencies<sup>1/</sup> (table 8). The information gives only acres by age class and supplements the material given in table 3 except the figures given there for western Oregon do not include BLM timberlands. An exact reconciliation of the information in tables 3 and 8 should not be attempted. The data for these tables came from different inventories conducted at different times and with different standards. For owners other than the BLM, the information in table 3 should be considered more definitive as the same inventory standards and definitions were applied to the lands managed by each agency.

<sup>1/</sup> DNR (Washington Department of Natural Resources), BLM, and The Oregon Department of Forestry.

**Table 8—Acreage administered by the BLM, Washington DNR, and Oregon Department of Forestry, by age class**

BLM		Washington DNR		Oregon Department of Forestry	
Age class	Acres	Age class	Acres	Age class	Acres
Years	Thousands	Years	Thousands	Years	Thousands
Nonstocked	76				
1-5	111	0	251	1-5	3
10	171	10	81	10	156
20	142	20	69	20	130
30	120	30	84	30	129
40	94	40	130	40	120
50	51	50	164	50	75
60	51	60	96	60	20
70	51	70	43	70	17
80	73	80	32	80	31
90	75	90	17	90	20
100	67	100-150	43	100	12
110	66			110	3
120	70			120-150	11
130-150	108				
160-200	132	160+	90	160+	3
210-250	128				
250-300	196				
310+	109				

## National Park Service

The National Park Service estimated that there are approximately 660,000 acres of old growth in the national parks in the Douglas-fir region.<sup>2/</sup> These are stands in excess of 200 years with a relatively heavy accumulation of downed logs on the forest floor. This figure does not include North Cascades National Park where vegetation mapping is just starting.

## Value of Old Growth

The other issue besides the inventory statistics is the supposition that old-growth timber is inherently more valuable than smaller or second-growth timber. The empirical evidence that supports this position has been scanty because reported Forest Service stumpage prices are volume-weighted averages of all species and sizes. The Washington DNR (Department of Natural Resources), however, has compiled their stumpage price data for second- and old-growth timber. This data for western hemlock/white fir (*Tsuga heterophylla* (Raf.) Sarg./*Abies concolor* (Gord. & Glend.) Lindl. ex Hildebr.) and Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco.)

<sup>2/</sup> Personal letter, June 13, 1983, from Jim Larson, NPS, Seattle, Washington.

**Table 9—Stumpage prices for second growth<sup>1/</sup> and old-growth<sup>2/</sup> western hemlock/white fir and Douglas-fir, by calendar year**

Calendar year	Western hemlock/white fir		Douglas-fir	
	Second growth	Old growth	Second growth	Old growth
- - - - - \$/MBF, Scribner scale - - - - -				
1970	\$ 33.68	\$ 48.18	\$ 36.60	\$ 86.06
1971	21.63	42.99	45.78	75.17
1972	14.09	76.64	54.13	110.41
1973	112.39	213.14	188.38	249.17
1974	108.48	208.22	163.56	253.11
1975	83.10	134.14	139.72	199.58
1976	93.00	169.15	126.76	212.32
1977	104.79	155.47	152.24	224.04
1978	130.39	189.89	152.79	297.23
1979	152.43	324.28	261.81	475.13
1980	282.19	315.69	295.63	482.31
1981	136.53	208.94	262.92	258.78
1982	108.39	144.52	160.70	228.00
1983	77.76	86.33	151.22	134.55
1984	65.64	76.68	133.39	207.64

<sup>1</sup>Second growth = timber aged 0 to 99 years.

<sup>2</sup>Old growth = timber aged 160 years or older.

Source: Unpublished data on file at the Washington Department of National Resources, Olympia, Washington.

are shown in table 9. Statistically the differences between second growth and old growth are significant<sup>3/</sup> for both species groups; that is, old-growth stumpage is more valuable than second-growth stumpage. In 1984 dollars, the average differences were \$98 for western hemlock/white fir and \$125 for Douglas-fir. The trend in the differences between old growth and second growth has been flat, however, during the past two decades; that is, old growth has not become progressively more valuable than second growth.

<sup>3/</sup>Significance was tested at the 5-percent level using an unpaired t-test for comparison of means. The price data was first deflated using the wholesale price index (1967=100).



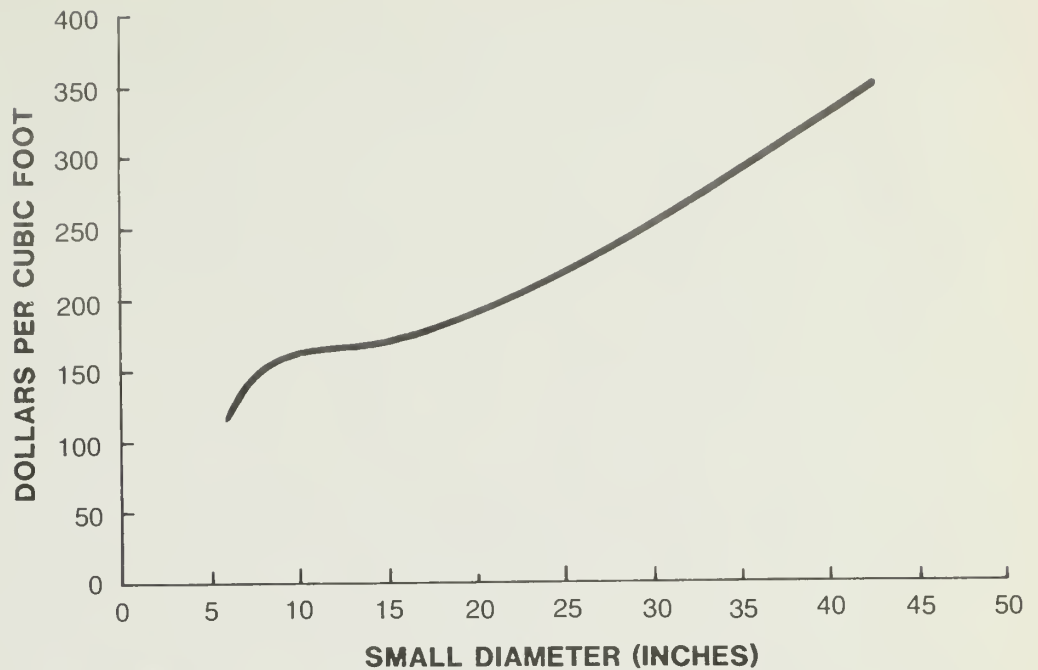


Figure 2.—Value of lumber recovery by log diameter.

Another way to judge value is product recovery. Although it is difficult to judge whether old growth has an inherently higher stumpage value, the relationship between log diameter and cubic recovery is well documented (Snellgrove and others 1985). These relationships expressed on a dollar-per-cubic-foot basis are shown in figures 2 and 3 for lumber and veneer, respectively. The curve for lumber reflects a combination of data from cutting and dimension mills. The curve rises fastest for small diameters as the basic problem of cutting square or rectangular boards from round logs becomes less of a factor, then continues to rise at decreasing rates as higher grade lumber is recovered from larger logs.



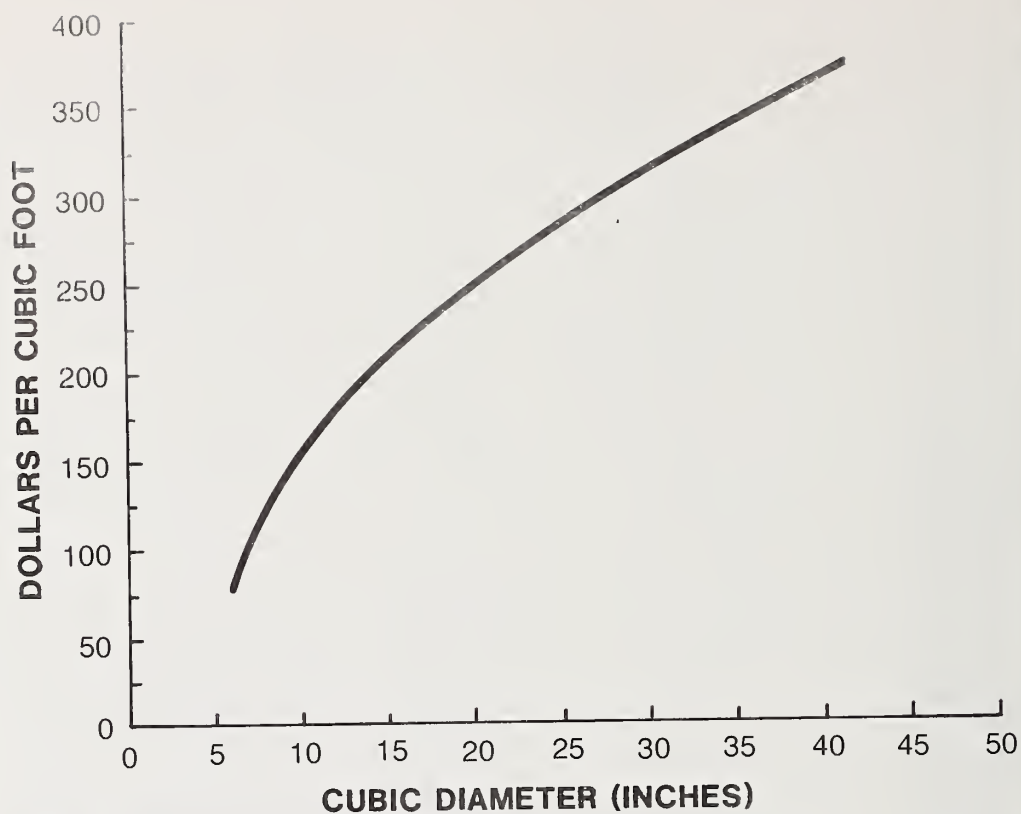


Figure 3.—Value of plywood recovery by log diameter.

Figures 2 and 3 show that the dollar recovery from logs varies directly with log diameter. The inference then is that larger logs having a higher value should have higher stumpage prices. The two figures are not directly comparable though, as different prices were used for each product and production costs were ignored.

## Discussion

The available inventory information is at best only suggestive of the volumes and areas of old growth left in the Douglas-fir region. The information available from tables 1-5 and table 8 is summarized as follows:

Age class	Forest Service	Other public			Forest industry	Other private	Total
		NPS	BLM	Other			
( Million acres )							
100+	4,861	660	876	251	769	169	7,586
160+	2,189	660	565	54	379	19	3,866
250+	1,876	660	305	47	371	19	3,278

Each line in the tabulation contains all acres that fall into that and all older age classes. The data were summarized for these three age classes because 100+ represents roughly the culmination of mean annual increment in the Douglas-fir region, 160+ is the Washington DNR definition of old growth, and 250+ is the Forest Service definition of old growth.

These estimates suggest that in the Douglas-fir region there are 3.3 million acres meeting the Forest Service age definition and probably another 0.6 million acres that are potential candidates for old-growth status in the next several decades. The data for the 100+ category include 2.3 million acres that are uneven-aged stands over 100 years old. There probably is an indeterminate amount of these stands that also meets either the Washington DNR or Forest Service definition of old growth. Nevertheless, the estimates of total old growth suggest that at the time of the inventories roughly 30 percent of the timberlands in the Douglas-fir region contain essentially mature (in excess of culmination of mean annual increment) timber.

The numbers are deceptive. First there is a necessary caution that age of existing stands (ignoring problems of measurement) is by itself a poor measure of old growth. Another caution is that the inventory data do not address the necessary stand characteristics that are integral parts of any old-growth definition. They do not, for example, include data on stand structure and composition. A third caution is the age of the inventory statistics—particularly those from the Forest Service. Most of these inventories are at least 10 years old and cutting activity during that time has probably taken place disproportionately in older stands.

The value information demonstrates, in part, the scarcity of old growth. In an economic sense, higher prices for old-growth stumpage represent a higher payment for both a relatively scarce resource and the potential for greater product recovery. These higher prices are also consistent with the perception that the volumes of old growth are declining. Lastly, high value provides some justification for retaining and managing older stands.

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## Acknowledgments

The following individuals provided information included in this note: Jim Smego and Chuck Chambers, Washington Department of Natural Resources; Tom Ortman, USDA Forest Service, Pacific Northwest Region; Gary Lettman, Oregon Department of Forestry; Don Preston, Bureau of Land Management Oregon State Office; and Don Gedney, Dan Oswald, Tom Farrenkopf, Sue Weaver, and Tom Fahey, Pacific Northwest Research Station. Tom Fahey also prepared the material shown in figures 2 and 3.

## Metric Equivalents

1 inch = 2.54 centimeters  
1 foot = 0.3048 meter  
1 cubic foot = 0.03 cubic meters  
1 acre = 2.47 hectares

## Appendix 1

### Terminology

**Age class**—A classification of stands for trees based on the midpoint of 10-year intervals.

**Diameter class**—A classification of trees based on diameter outside the bark measured at breast height, 4-1/2 feet (1.37 m) above the ground. D.b.h. is the common abbreviation for “diameter at breast height.”

**Dominant trees**—Live trees with crowns extending above the general level of the crown canopy and receiving full light from above and partly from the side; larger than the average trees in the stand and with crowns dense, comparatively wide and long, but somewhat crowded on the sides.

**Forest industry lands**—Lands owned by companies or individuals operating wood-using plants.

**Forest land**—Land at least 10 percent stocked by live trees or land formerly having such tree cover and not currently developed for nonforest use.

**Growing stock trees**—All live trees with the exception of cull trees.

**Growing stock volume**—Net volume in cubic feet of live sawtimber and poletimber growing stock trees from stump to a minimum 4-inch (10-cm) top (of central stem) outside the bark. Net volume equals gross volume less deduction for rot and missing bole sections. Growing stock trees are subdivided into poletimber and sawtimber trees.

**Land area**—Area reported as land by the Bureau of the Census. Total land area includes dry land and land temporarily or partially covered by water, such as marshes, swamps, and river flood plains; streams, sloughs, and canals less than one-eighth mile (200 m) wide; and lakes, reservoirs, and ponds less than 40 acres (16 ha) in area.

**Mean annual increment**—A measure of the productivity of forest land in terms of the average increase in cubic-foot volume per acre per year. For a given species and site index the average is based on the number of years needed for the mean annual increment to culminate in fully stocked stands.

**Mortality**—Volume of sound wood in trees dying from natural causes during a specified period.

**National Forest lands**—Federal lands that have been designated by Executive order or statute as National Forest or purchase units and other lands under the administration of the Forest Service, including experimental areas and Bankhead-Jones Title III lands.



**Net annual growth**—The net increase in volume of trees during a specified year. Components of net annual growth of trees: (a) the increment in net volume of trees alive at the beginning of the specified year and surviving to the year's end, plus (b) the net volume of trees reaching sawtimber or poletimber size during the year, minus (c) the net volume of trees that died during the year.

**Nonstocked areas**—Timberland less than 10 percent stocked with growing stock trees.

**Other private lands**—All privately owned lands except those classed as forest industry lands.

**Other public lands**—Lands administered by public agencies other than the Forest Service.

**Poletimber stands**—Stands with a mean diameter (weighted by basal area) from 5.0 to 9.0 inches (12.5 to 22.5 cm) if softwood and from 5.0 to 11.0 inches (12.5 to 27.5 cm) if hardwood.

**Poletimber trees**—Live trees of commercial species at least 5.0 inches (12.5 cm) in d.b.h. but smaller than sawtimber size, and of good form and vigor.

**Roundwood**—Logs, bolts, or other round sections cut from trees.

**Salvable dead trees**—Standing or down trees of commercial species, at least 9.0 inches (22.5 cm) in d.b.h. for softwoods and at least 11.0 inches (27.5 cm) in d.b.h. for hardwoods, containing 25 percent or more sound wood volume and at least one merchantable 12-foot (3.8-m) log if softwood or one merchantable 8-foot (2.5-m) log if hardwood.

**Sapling and seedling stands**—Stands with a mean diameter (weighted by basal area) less than 5.0 inches (12.5 cm).

**Timber harvest**—Volume of roundwood removed from forest land for products.

**Timber volume**—Includes the net volume in cubic feet of poletimber and sawtimber trees and salvable dead sawtimber trees of all species, the net volume in cubic feet of cull trees of commercial species, and gross volume of noncommercial species. Volume is measured from stump to a minimum 4-inch (10-cm) top outside the bark.

**Timberland**—Forest land capable of producing 20 cubic feet or more per acre (1.4 m<sup>3</sup>/ha) per year, and not withdrawn from timber utilization.

**Uneven aged**—Stands in which less than 70 percent of the growing stock volumes are in three adjoining age classes.

**Uneven aged over 100**—An unevenaged stand where the main stand is over 100 years of age.

**Uneven aged under 100**—An unevenaged stand where the main stand is under 100 years of age.

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